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# Implications of Shuttle Operations on the Question of Definition and/or the Delimitation of Outer Space

## I. The Issue

In the context of discussions in the Legal Subcommittee of the UN Outer Space Committee the issue can be divided into four parts:

A. How to deal with demands and arguments for an early definition/delimitation of space.

B. Whether a specific altitude should be used as a demarcation for outer space, and if so, what altitude.

C. Whether a functional definition of space should be advocated, in preference to an altitude demarcation.

D. What the implications of anticipated Shuttle operations are with respect to US positions on the foregoing issues.

## II. Discussion

### A. The question of early definition/delimitation.

The following are some of the arguments or reasons why an early definition/delimitation of space has been urged on the Legal Subcommittee:

--since outer space is subject to the Outer Space Treaty equatorial states (notably Colombia and

Ecuador) wish to define space so that the geosynchronous orbit region is excluded, and thus more vulnerable to claims of sovereignty.

--forthcoming Shuttle operations require a clear distinction between the spheres of air law and outer space law, so as to avoid future disputes.

--Shuttle operations will stimulate Third World country claims to higher air space; the sooner the issue is joined the lower the limit of outer space that can be agreed upon.

--if the issue is not dealt with in the Legal Subcommittee it may be seized by the ICAO, which has an interest in increasing its area of cognizance, and which makes decisions on a majority rather than consensus basis.

--lack of definition may in some way weaken the ABM or possible ASAT treaties.

The US has several reasons for wishing to postpone a definition/delimitation:

--the characteristics of future aerodynamic reentry vehicles, in terms of flight path, maneuverability, function, are still unclear.

--it is not clear what upper limit of airspace best serves US security interests.

--Shuttle operations without a definition/delimitation would demonstrate that the interests of subjacent states were not harmed thereby.

--the fundamental difference of national interest between a low or high demarcation of outer space can best be bridged over time by increasing the familiarity of non-space countries with the technical aspects of proposed definitions and with the capabilities of space-air vehicles.

--no compelling case has been made in favor of an early definition/delimitation.

--it is not clear what motivates the Soviets to propose that the space-airspace boundary should be no higher than 100 kms, but possibly lower.

To counter demands for a definition/delimitation the US could propose that the matter be considered after Shuttle flights have become operational.

B. <u>The question of altitude demarcation</u>.

Most supporters of definition/delimitation favor an altitude demarcation, variously based on the atmosphere, on

layers of the atmosphere (80-90 km or 100 ± 10 km), the maximum altitude of aircraft flight (60-120 km, i.e., 90 km), the aerodynamic characteristics of flight (84 km), the lowest perigee of an orbiting satellite (90 km), the earth's gravitational effects (1.5 million km), effective control, and on "mesospace" (a region between 50 and 130 km).[1]

Each of these proposed boundaries has its critics. The atmosphere and layers of atmosphere are rejected on the grounds that they lack the stability and precision required for the basis of an international agreement. Boundaries based on aerodynamic characteristics or maximum aircraft altitudes are unstable because they are linked to technological development. The criterion of effective control is opposed for the prece ding reason, and because it does not treat all states as equal subjects of international law. "Mesospace" is opposed on the grounds that it offers no solution to whatever problems definition/delimitation is intended to solve.

The demarcation provided by the lowest perigee of an orbiting satellite apparently has few critics.

The US has not acknowledged that an altitude demarcation (or any other definition/delimitation) is necessary. In the context of the various altitudes proposed, however,

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[1] The Question of the Definition and/or the Delimitation of Outer Space, UN Document A/AC.105/C.2/7 and Add.1, 21 January 1977.

the US has indicated informally that if an upper limit of airspace should be found necessary or practicable, it should be related to the operational (useful) altitude of aircraft or balloons. This would be no higher than 40-45 kms. This boundary is also subject to the criticism that it is unstable being linked to technology.

The Soviet Union has proposed an understanding that the space-airspace demarcation be no higher than 100 km. It would then be negotiable as to how much lower the line would be. The US opposes this suggestion because the figure is too high, and once accepted as the upper limit, it would be difficult to lower.

C. The question of a functional definition of outer space.

A functional approach is not based upon the location of the air or space activity, but upon the nature of the activity. It is partly motivated by considerations of securing passage for spacecraft through airspace.

One functional solution would be to provide that both air law and space law determine and prohibit those activities which are prejudicial to subjacent states. Another proposal is that the right of innocent passage through airspace for the purpose of using outer space must be recognized as a corollory of the Outer Space Treaty, however, the right of

passage doesnot permit activities contrary to international law, or harmful to the subjacent state.

Functional solutions are criticized for replacing the problem of two zones with two different legal regimes by the problem of a single space with two different legal regimes parallely applied. Another criticism is that the preoccupation of securing passage for spacecraft through airspace is unjustified, since routine space vehicle flights through the atmosphere have not led to complaints or claims. The right of innocent passage is a right derived from the right of free access to space, period.

There is no convincing rationale that innocent passage of spacecraft through airspace is detrimental: weapons delivery by a vehicle (having been) in orbit is prohibited by the Outer Space Treaty. Reconnaissance is more efficient at higher altitudes. The fact that innocent passage assumes airspace does not require that there be a definition of when innocent passage (airspace) begins and ends.

D. Background on Shuttle.

The Shuttle is a reusable spacecraft about the size of a DC-9. Launched from Kennedy Space Center (KSC) it carries 65,000 lb. payloads into a 28.5° orbit inclination.

Launched from Vandenberg Air Force Base (VAFB) it can carry 32,000 lb. payloads into an orbit inclination as high as 104°. Its orbital altitude is between 144 km and

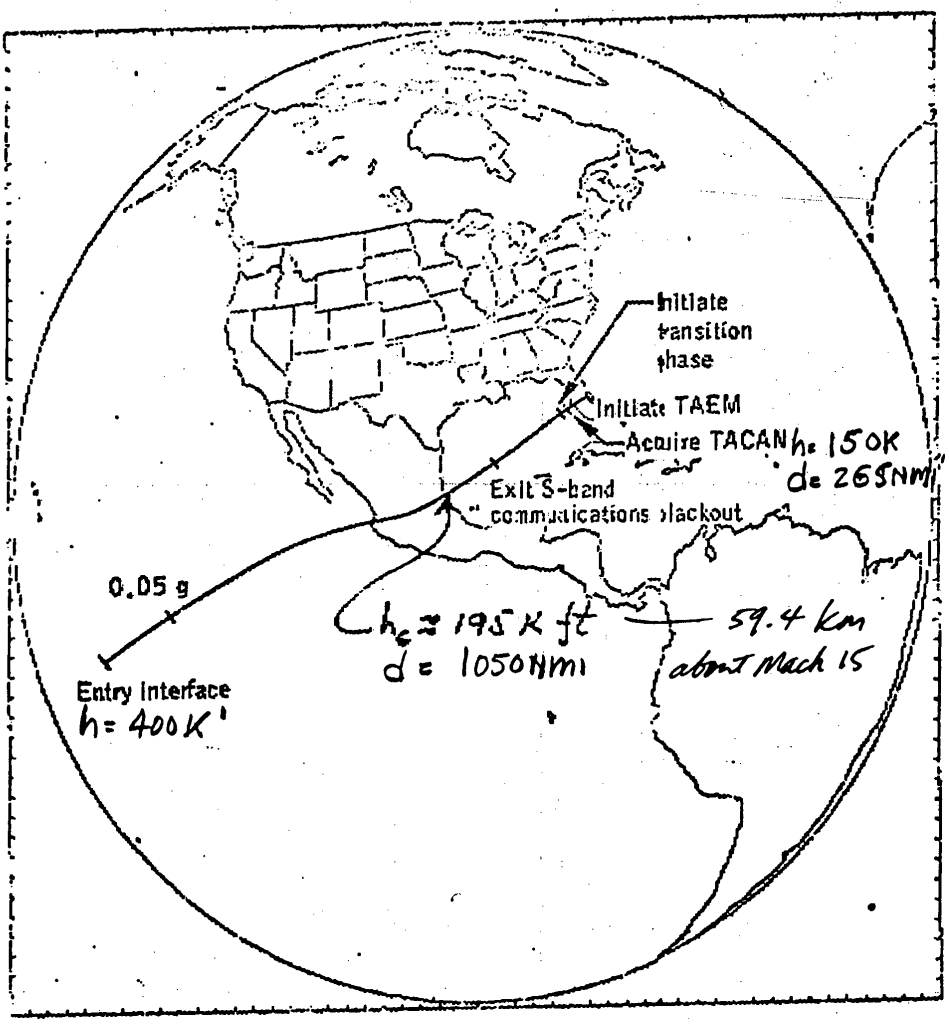



Figure 4.3-6.- Entry groundtrack for shuttle BRM 1. – 28.5° out of KSC

MISSION 1

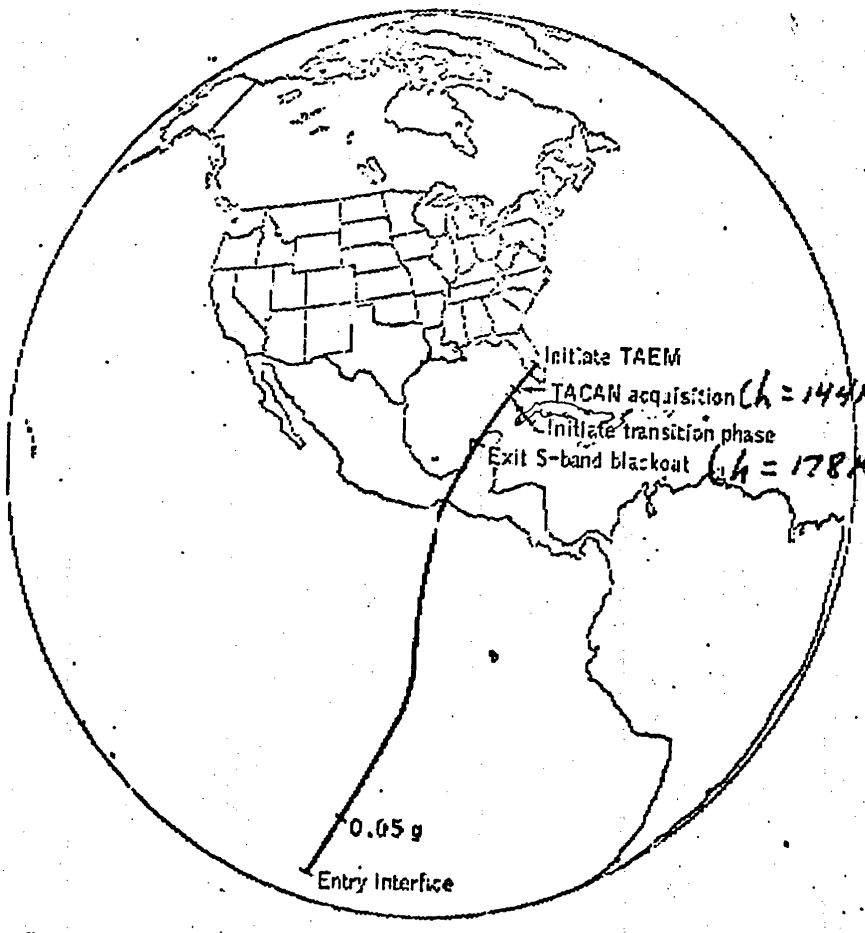



Figure 4.3-5. - Shuttle BRM 2 groundtrack from entry interface to terminal area.

MISSION 3A, B

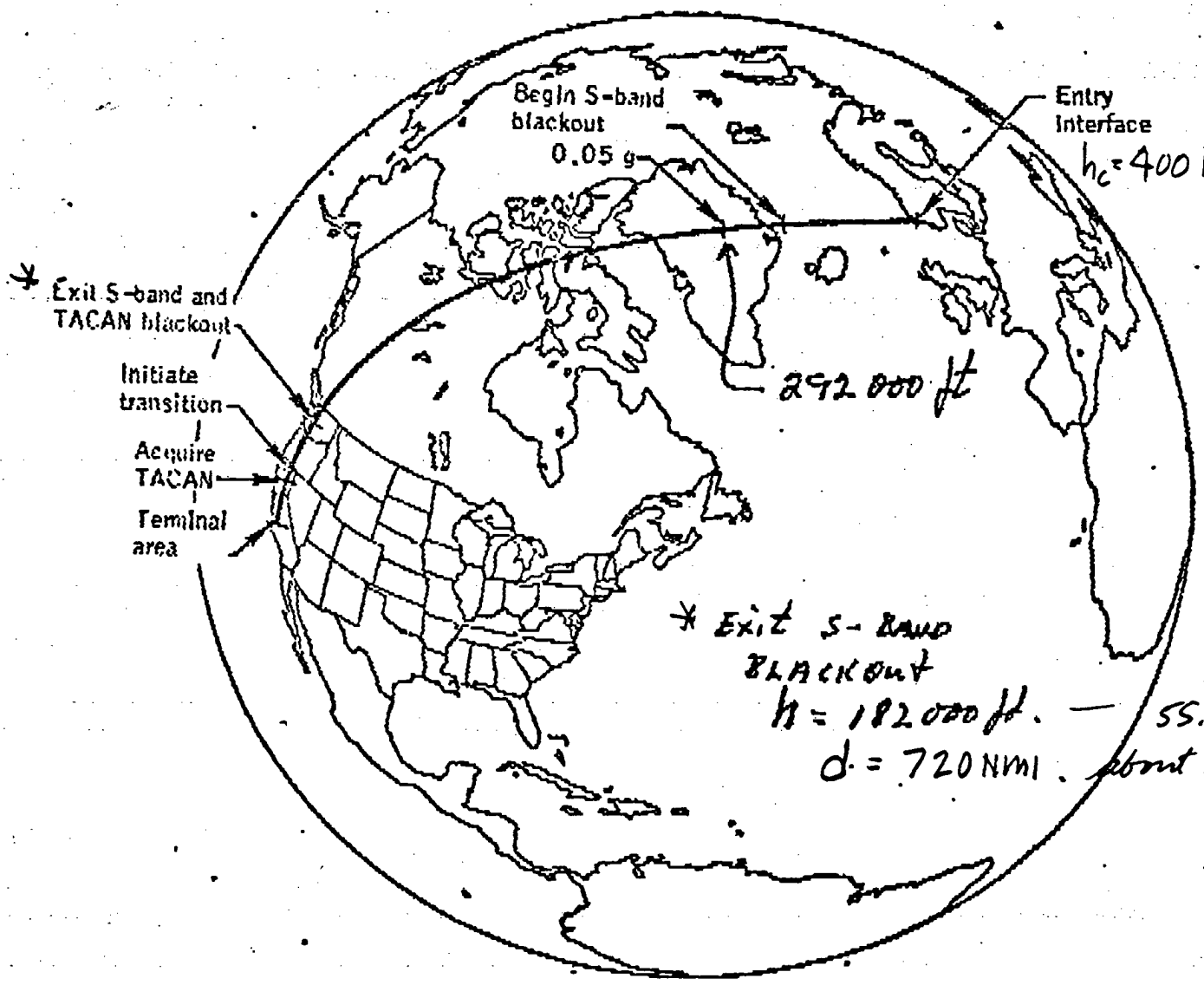


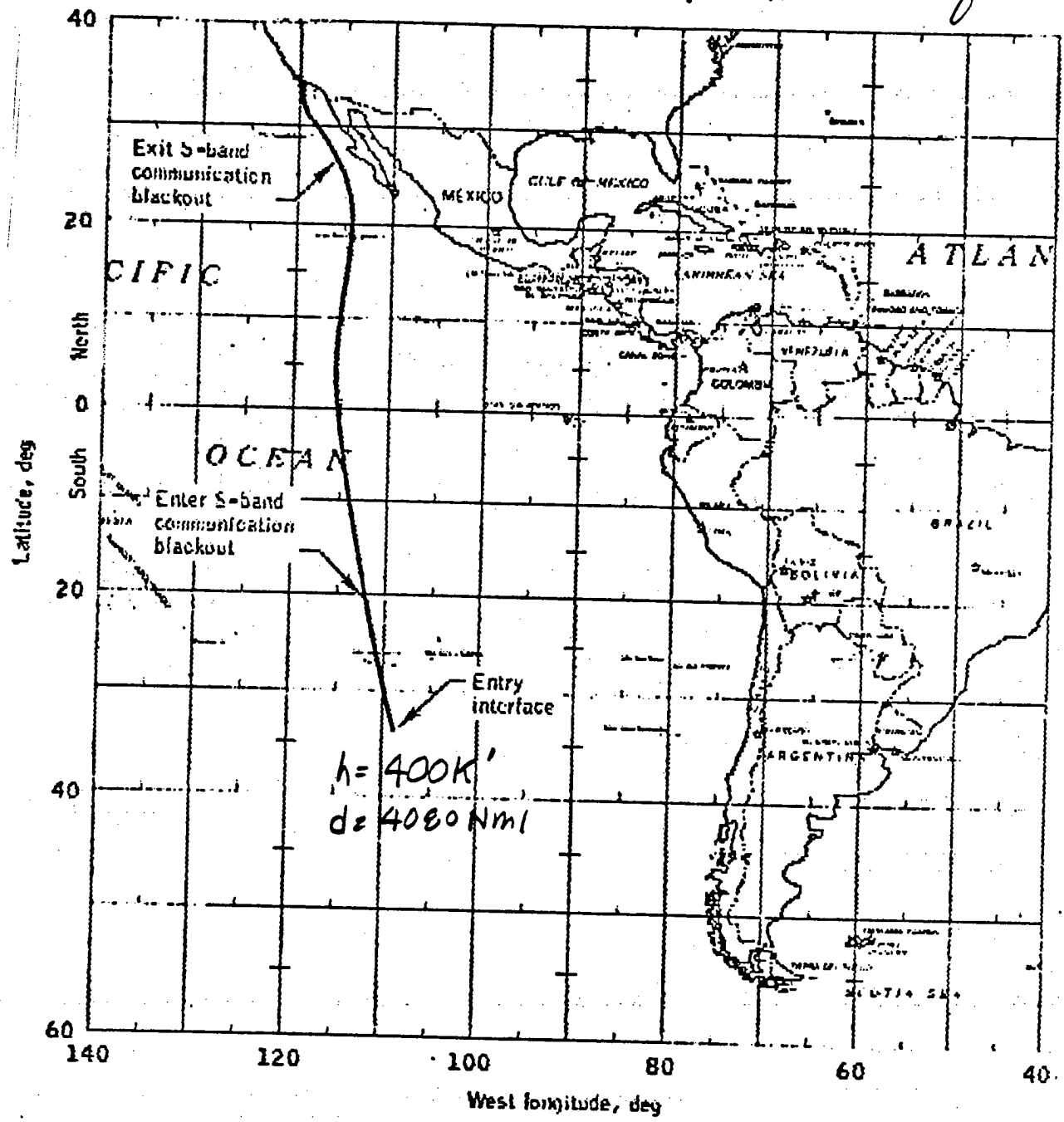

Figure 4.3-6.- Shuttle BRM 3A groundtrack from entry interface to landing.

Air force requirements - 104° inclination



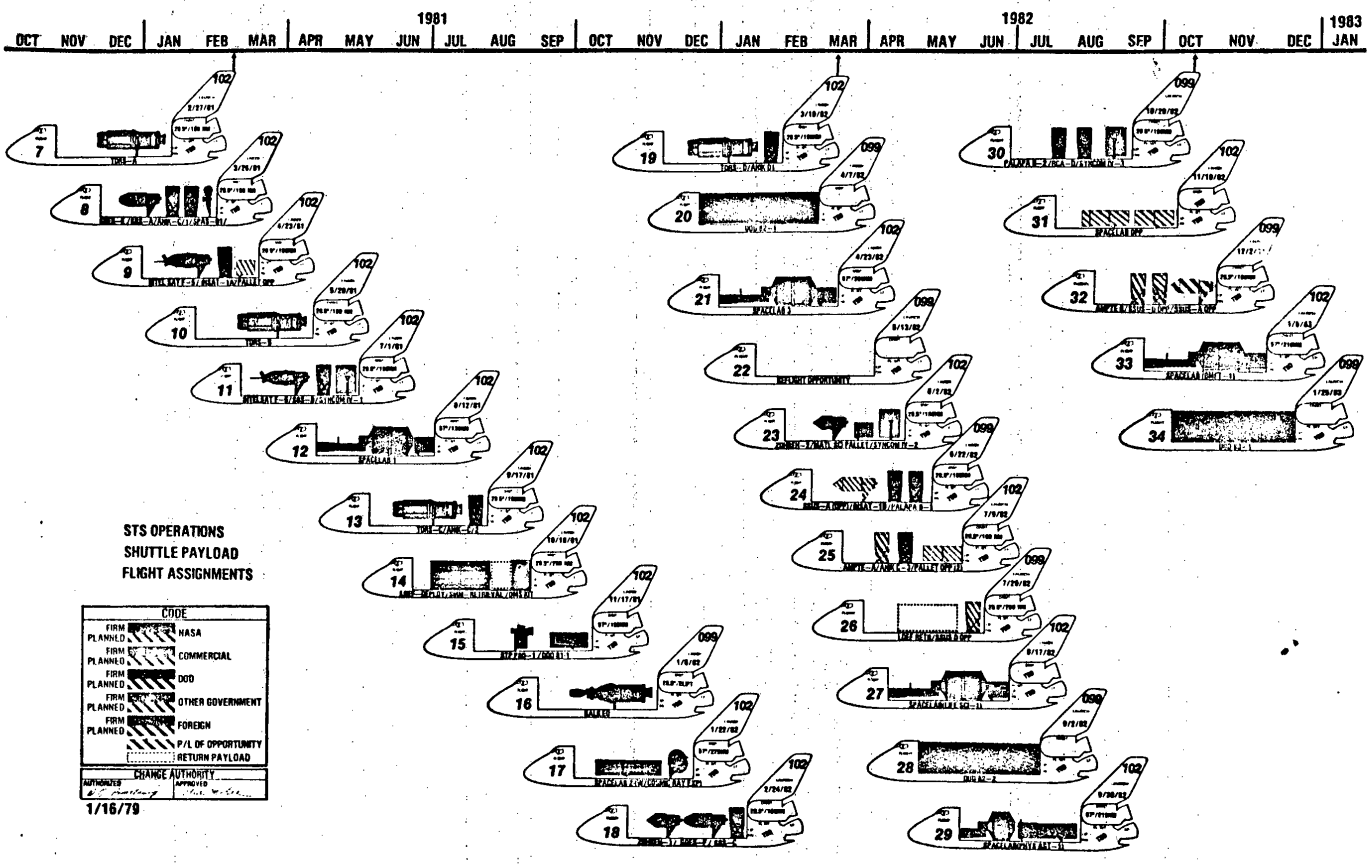
(4)

MISSION 4 - Air force requirement




(a) Entry interface to landing

Figure 104.- Entry groundtrack for orbiter.



and 240 km. When Shuttle becomes operational, between 40 and 60 flights per year will be made to various orbits and inclinations. Six Orbital Test Flights (OFT's) are planned for 1980-81 before operations begin.

Operation at relatively lower altitudes occurs on approach to landing, rather than on launching into orbit. The designated landing sites are KSC and Edwards Air Force Base, California.

E. Shuttle Implications.

US doubts about altitude demarcations of space are confirmed by the flight profiles of four Baseline Reference Missions (BRM's), which were prepared to represent Shuttle's operational capabilities at very low and very high orbit inclinations. The lowest altitudes of flights returning to Florida or California (leaving Canadian or Mexican "airspace") are between 50 and 60 km.

Emergency landings are omitted from discussion because penetration of foreign airspace under those conditions would be authorized by the Agreement on the Rescue of Astronauts, Return of Astronauts and Space Objects.

Shuttle operations present no new arguments on the need for an early definition/delimitation of space. New hybrid vehicles may be under study, however, with different flight characteristics, glide paths, and maneuverability,

which would strengthen the case for avoiding a premature definition.

III. US Position.

A. Early definition/delimitation of space.

In the absence of a demonstrated need and without knowing what purposes a definition would, could, or should serve, it is undesirable to accept a definition which may later be found to be inappropriate or wanting in some major respects. The US should propose that the matter be reconsidered after Shuttle operational experience has been obtained.

B. Altitude demarcation.

The US should point out the inadequacies of the solutions and the combined solutions proposed, and reiterate position A rather than be drawn into bargaining over altitude.

C. Functional definition/delimitation.

The US should urge that functional concepts be explored further, particularly the right (and obligations) of innocent passage.

D. Shuttle implications.

The US should stress the ways in which Shuttle operations, and the US space program serve and benefit all countries. At UN forums /The US should outline and encourage different types of foreign participation.